Improved Calculation Of Finite-Element Analysis Of Bipolar Coronaincluding Ion Diffusion

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Summary

This paper presents an iterative method for the analysis of bipolar corona associated with the ionized field around high-voltage bipolar direct-current (HVDC) transmission-line conductors. A new finite-element technique (FET) is proposed to solve Poisson's equation where the constancy of the conductors surface field at the corona onset value is directly implemented in the finite-element formulation. Satisfying the current continuity condition and updating the space-charge density are based on the application of Kirchoff's current balance law at each node of the finite-element grid and take the ion diffusion into account. In order to investigate the effectiveness of the proposed method, a laboratory model was built. It has been found that the calculated V-I characteristics and the ground plane current density profiles agreed well with those measured experimentally. The simplicity in writing the computer program, in addition to the low number of iterations required to achieve convergence, characterize the new method of analysis